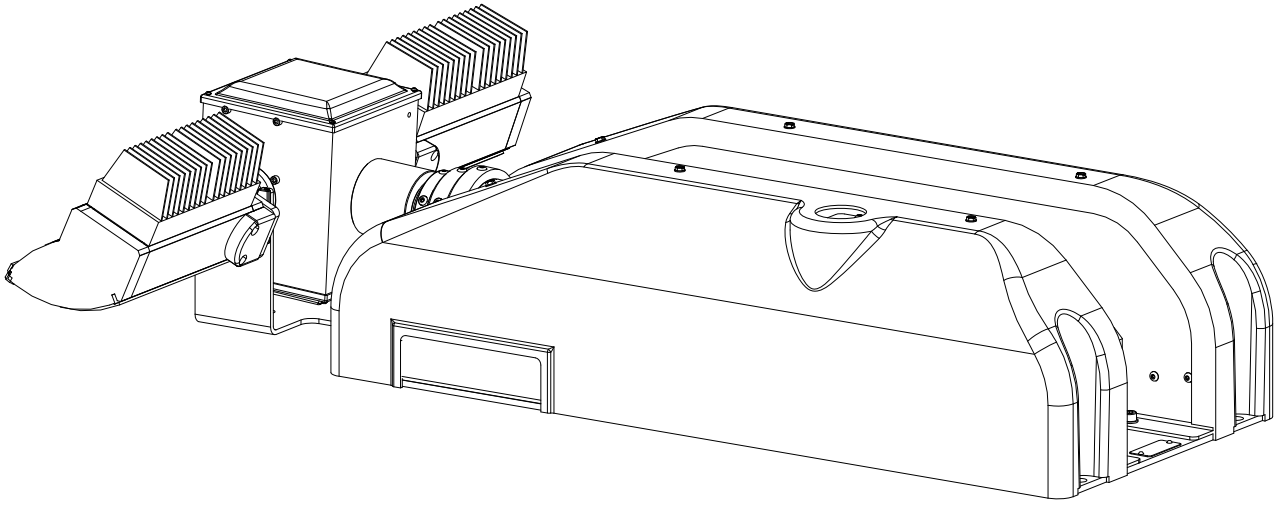
NIGHT SCAN CHIEF
INSTALLATION, OPERATION & MAINTENANCE MANUAL



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SAFETY SUMMARY

SIGNAL WORD DEFINITION

Per the ANSI Z535.4 standard, the following signal words and definitions are used to indicate hazardous situations:

⚠ DANGER

DANGER indicates an imminently hazardous situation that, if not avoided, will result in death or serious injury.

⚠ WARNING

WARNING indicates a potentially hazardous situation that, if not avoided, could result in death or serious injury.

⚠ CAUTION

CAUTION indicates a potentially hazardous situation that, if not avoided, may result in minor or moderate injury. It is also used to alert against unsafe practices.

GENERAL SAFETY PRECAUTIONS

The following are general safety precautions that are not related to any specific procedures and therefore do not appear elsewhere in this publication. These are recommended precautions that personnel must understand and apply during many phases of operation and maintenance.

⚠ DANGER

Electrocution Hazard! Contact with high voltage will result in death or serious injury. Observe general safety precautions for handling equipment using high voltage. Do not locate or operate mast near electrical lines, cables or other unwanted sources of electricity. Do not operate mast in lightning. Be certain electrical cables are undamaged and properly terminated. Always disconnect power before performing service, repair or test operations.

⚠ WARNING

Safety Instruction - Read Manual! Failure to follow operating instructions could result in death or serious injury. Read and understand the operator's manual before using the mast.

⚠ WARNING

Tip Over Hazard! Mast tip over could result in death or serious injury. Do not operate in high winds. Operate on level ground only. Stand clear of mast and mast payload during operation. Be certain mast is level and secure before and during installation, operation and maintenance.

⚠ WARNING

Safety Instruction - Trained Personnel Only! Death or serious injury could result if proper inspection, installation, operation and maintenance procedures are not observed. Installation, operation and maintenance to be performed by trained and authorized personnel only. Proper eye protection should be worn when servicing the mast.

⚠ WARNING

Health and Safety Hazard! Solvent used to clean parts is potentially dangerous. Avoid inhalation of fumes and also prolonged contact to skin.

⚠ WARNING

Safety Instruction-Do not look at lights! Do not look directly into lights when they are illuminated. Temporary impairment or permanent vision damage could occur.

⚠ WARNING

SPECIFIC SAFETY PRECAUTIONS

The following are safety precautions that are related to specific procedures and therefore appear elsewhere in this publication for emphasis. These are recommended precautions that personnel must understand and apply during specific phases of installation, operation and maintenance.

⚠ WARNING

Safety Instruction-Operation! For outdoor use only. Do not use in areas that have been classified as hazardous as defined in Article 500 of the National Electric Code.

⚠ WARNING

Crush Hazard! Death or serious injury could result if mast fails suddenly. Do not stand directly beneath the mast or its payload. Be certain payload is properly installed and secured.

⚠ WARNING

Burst Hazard! Over pressurizing mast will trip safety valve and could result in death or serious injury. Do not exceed maximum operating pressure of 20 psi (138 kPa) for Standard Duty masts. Keep personnel clear of safety valve exhaust direction.

⚠ WARNING

Fire Hazard! Cleaning solvent, used for maintenance, is flammable and can be explosive resulting in death or serious injury. Do not smoke. Use cleaning solvent in a well-ventilated area. Keep cleaning solvent away from ignition sources. Always store cleaning solvent in the proper marked container.

⚠ WARNING

Relocation Hazard! Relocating the mast during operation or after extension could result in death or serious injury. Do not relocate the mast during operation or while extended. This applies especially to masts mounted to vehicles. Operate the mast only if the vehicle is stationary and the vehicle engine is off.

⚠ WARNING

Mast Extension Hazard! Extending mast into obstructions could result in death or serious injury and could render the mast inoperable and partially extended. Before applying power and operating the mast, be certain there is sufficient clearance above and to all sides of the expected location of the fully extended mast and payload. Keep all persons clear of mast and mast extension. Do not lean directly over the mast.

⚠ WARNING

Mounting Structure Hazard! Mounting mast into a structure unable to resist the forces generated from customer-specific loading scenario could result in death or serious injury and could damage the mast. Before operation, be certain mounting structure is capable of resisting forces generated from all loading and environmental conditions, including, but not limited to, mast size and weight, payload size and weight, sail size, wind speed, guy line arrangement, support bracket or roof line location and base plate assembly.

⚠ WARNING

Electrocution Hazard! Do not touch live wires. Death or serious injury could result.

⚠ WARNING

Safety Instruction – Operation! Make sure all power has been disconnected prior performing maintenance.

⚠ WARNING

Safety Instruction -Trained Personnel Only! Only trained and qualified personnel should perform installation, adjustments, and servicing. Only a properly trained and qualified certified electrician should perform electric installations and service.

⚠ WARNING

When relamping an installed fixture, make sure all power to fixture is off and that the fixture is cool

⚠ WARNING

Safety Instruction – Operation! At all times prior to mast operation, insure that:

1.) The mast area is free of personnel and mechanical obstruction;
2.) All electrical cables are undamaged and properly terminated;
3.) The operator must have full view of the mast during use;
4.) Any transit tie-downs on the payload have been removed;
5.) The vehicle is not moving;
6.) The area above the mast is free of mechanical obstructions.

⚠ CAUTION

Safety Instruction-Operation! Lamps are extremely hot and should not come into contact with people or combustible and/or explosive materials. Do not operate if breakage occurs or unit is knocked over.

⚠ CAUTION

Entanglement Hazard! Tangled cables can cause equipment damage. Ensure control cables are not tangled and are free to pay out as mast is extended.

⚠ CAUTION

Safety Instruction – Installation! At all times while using pipe and hose during installation, recognize that:

1.) Pipe and hose should be routed, mounted and restrained to protect from damage;
2.) Do not use second hand piping for installation;
3.) Do not bend air pipe and hose at a radius less than specified by the manufacturer;
4.) Pipes should be marked to avoid hazards from incorrect connection;
5.) The exhaust should be fitted with a silencer and be directed away from personnel;
6.) When routing piping, install in such a way as to minimize torsion on the joints;
7.) Mounting air pipe and hose shall be accomplished only by the use of tools to prevent readily disconnecting air pipe and hose from mast.

⚠ CAUTION

Safety Instruction – Operation! Do not operate the Chief vertical RCP during an electrical storm.

⚠ CAUTION

Lifting Hazard! Manually lifting over 55 lb (25kg) is prohibited. In the UK, all lifting equipment must be thoroughly examined annually by a competent person according to the Lifting Operations and Lift Equipment Regulations 1998. Equivalent regulations exist in other EU states.

⚠ CAUTION

Safety Instruction – Operation! All operators must read the Operation section of this manual and be properly trained.

CHAPTER 1
INTRODUCTION

1.1 SAFETY PRECAUTIONS

Refer to the Safety Summary for precautions to be observed while operating or servicing this equipment.

1.2 INTRODUCTION

This manual covers the installation, operation, troubleshooting and maintenance instructions for the Night Scan Chief. The manual should be reviewed in its entirety. Contact the Will-Burt factory with any questions before performing any procedures outlined in this manual.

1.3 DESCRIPTION

The Night Scan Chief is a transportable lighting system consisting of a directionally adjustable group of lights attached to a self-erecting, extensible mast. Air pressure required to extend the mast is provided by a compressor unit mounted within the Night Scan Chief. The unit is designed for installation on any vehicle for the purpose of providing on the scene temporary lighting. Refer to Figure 1-1 for identification of the major components of the Night Scan Chief unit.

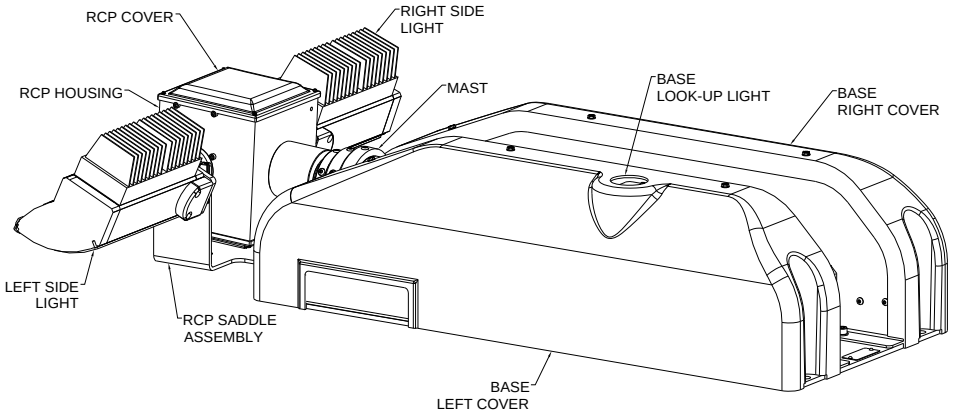

Figure 1-1 Night Scan Chief Base and Remote Control Positioner

1.4 REFERENCE DATA

The reference data for the Chief given in Table 1-1 is not inclusive of all models. Please refer to product literature or www.willburt.com for additional information including length, width and height information.

Table 1-1. Reference Data Night Scan Chief

Model No.	140DC	300DC	1800	3000P	5400	6000
NS6 Stowed Height	10 in	10 in	10 in	10 in	10 in	10 in
NS7.5 Stowed Height	10 in	10 in	10 in	10 in	10 in	10 in
NS6 Ext. Height	6ft.	6ft.	6ft.	6ft.	6ft.	6ft.
NS7.5 Ext. Height	7ft-6in	7ft-6in	7ft-6in	7ft-6in	7ft-6in	7ft-6in
Total Unit Weight**	100 lb.	100 lb.	100 lb.	110 lb.	120 lb.	130 lb.
Tube Diameter Range	3.5 to 2.5in	3.5 to 2.5in	3.5 to 2.5in	3.5 to 2.5in	3.5 to 2.5in	3.5 to 2.5in
No. of Mast Sections	3	3	3	3	3	3
Mast Air Volume (NS7.5)	0.26 cu. ft.	0.26 cu. ft.	0.26 cu. ft.	0.26 cu. ft.	0.26 cu. ft.	0.26 cu. ft.
Max. Operating Air Pressure	20 psi	20 psi	20 psi	20 psi	20 psi	20 psi
Required DC Electrical Power Supply	12V/20 amp 24V/10 amp	12V/20 amp 24V/10 amp	12V/20 amp 24V/10 amp	12V/20 amp 24V/10 amp	12V/20 amp 24V/10 amp	12V/20 amp 24V/10 amp
Required Electrical Supply for Lights	12V/12 amp 24V/6 amp	12V/25 amp 24V/13 amp	220V/10 amp	220V/15 amp	220V/25 amp	220V/30 amp

*Maximum dimension is the largest dimension on all specified models.

**Weight given is approximate for 7.5-foot models

1.5 TECHNICAL INFORMATION

Power Requirements

The DC power for the Chief is supplied through direct connection to the base circuit board. The DC power is internally protected with a 20 amp auto-resetting circuit breaker. The Chief will operate from either 12 or 24 volt DC power with no customer changes necessary. The electronic system has built in reverse polarity protection. For optimum performance, a minimum of 11 volts is required at the Chief base. Long runs of cable can introduce power loss For long runs, it may be necessary to add an intermediate junction box in the DC cable so that DC power can be applied closer to the Chief.

Mast Loads

It is important that the mast be securely mounted to a sturdy platform, which will not overturn during operational loading of the mast. Figure 1-2 provides loading information for the mast, which can be expected during operation. All values given are in lbs.

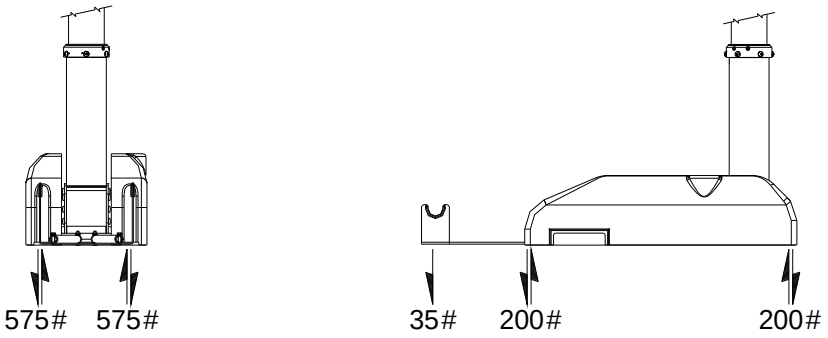

Figure 1-2 Mast Loads

CHAPTER 2
INSTALLATION

⚠ WARNING

Safety Instruction -Trained Personnel Only! Only trained and qualified personnel should perform installation, adjustments, and servicing. Only a properly trained and qualified certified electrician should perform electric installations and service.

⚠ WARNING

Safety Instruction -Trained Personnel Only! Only trained and qualified personnel should perform installation, adjustments, and servicing. Only a properly trained and qualified certified electrician should perform electric installations and service.

⚠ CAUTION

Lifting Hazard! Manually lifting over 55 lb (25kg) is prohibited. In the UK, all lifting equipment must be thoroughly examined annually by a competent person according to the Lifting Operations and Lift Equipment Regulations 1998. Equivalent regulations exist in other EU states.

2.1 INTRODUCTION

The Chief has been designed to provide for ease of installation. This section of the manual provides the procedures that must be followed to insure a successful installation. Be sure to read and understand the entire installation procedure before you begin.

2.2 TOOLS AND MATERIALS REQUIRED FOR INSTALLATION

Table 2-1 provides a list of tools and materials required to install and test the Night Scan Chief.

Wrenches	Crimping tool or Solder set
Screwdrivers	Wire cutter/stripper
½ inch or M12 Mounting Hardware (6 each)	Multimeter (to verify power is turned OFF)
Torque wrench	Clean Shop Rags
Drill	
Hoist (minimum 250 lb capacity)	

Table 2-1. Tools and Materials Required for Installation

2.3 UNPACKING

Unpack the Night Scan Chief as follows:

1. Carefully open and remove all parts from shipping container.
    - Lift the unit from the shipping container by the base tube (see Figure 2-1).
    - **Do not lift the Night Scan by the lights or RCP.**
2. Inspect for any shipping damage. If damage has occurred, notify carrier.
3. Be sure that all components are included and that the required tools are readily available.

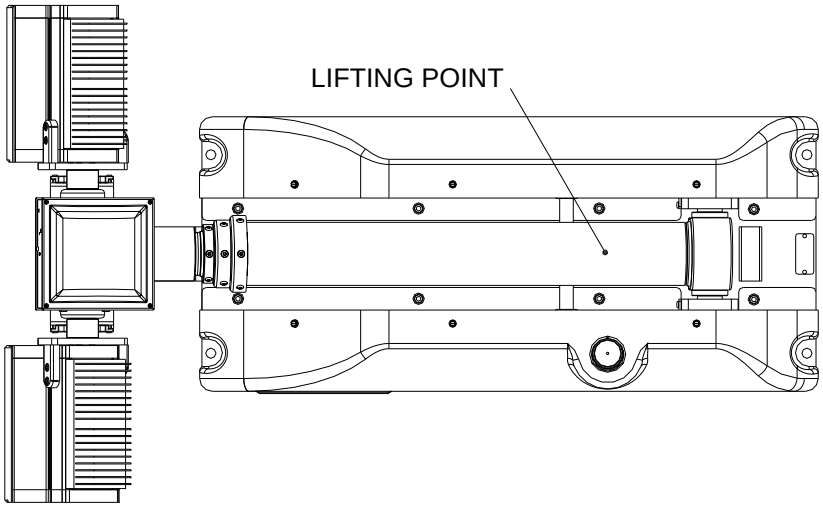

Figure 2-1 Lifting Point

2.4 ATTACHING TO VEHICLE

If the Night Scan Chief is to be mounted in a well, be certain that adequate drainage is provided. A minimum of (4) drain holes (one per corner) at least one inch in diameter is recommended. While the unit has been designed to withstand adverse environmental conditions, it cannot be submerged.

The mounting holes provided on the unit are 9/16 inches in diameter. There are four holes in the base plate and two holes in the RCP saddle. Studs or bolts (not provided) shall be located on the vehicle in accordance with Figure 2-2. It is important that the surface be flat such that the saddle and base plate are in the same plane. The areas to which the unit is mounted must be reinforced to withstand loading as shown in Figure 1-2. Attach and torque all hardware as appropriate for its material and size. It may be advantageous to attach the four (4) mounting bolts in the base plate, complete the wiring as outlined in the following sections and raise the unit before attaching the saddle bolts. Be certain that the saddle bolts are located in accordance with Figure 2-2 and that the saddle is centered with respect to the RCP. Adjust the location if necessary.

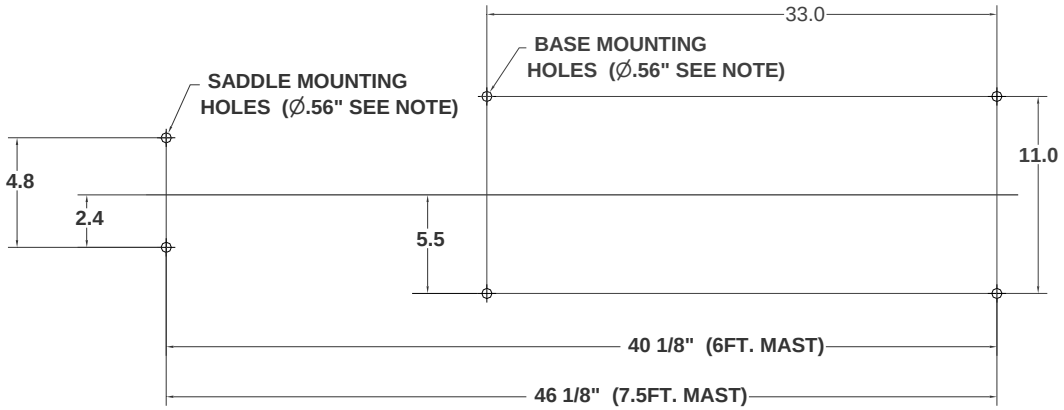

Figure 2-2 Night Scan Base Mounting Hole Locations

Junction Box Installation

The junction box serves as an interface between the Hand Held Remote Control and the Night Scan Base. It is not used in installations where only the Panel Mount Remote Control is used. The junction box is not rated for installation in wet locations. The installer must take necessary precautions to seal the lid and the knockouts if installation in a wet location is unavoidable. The junction box also serves as a location to which DC power is routed by the installer for the unit. It may be flush or surface mounted. Hardware for mounting is not supplied.

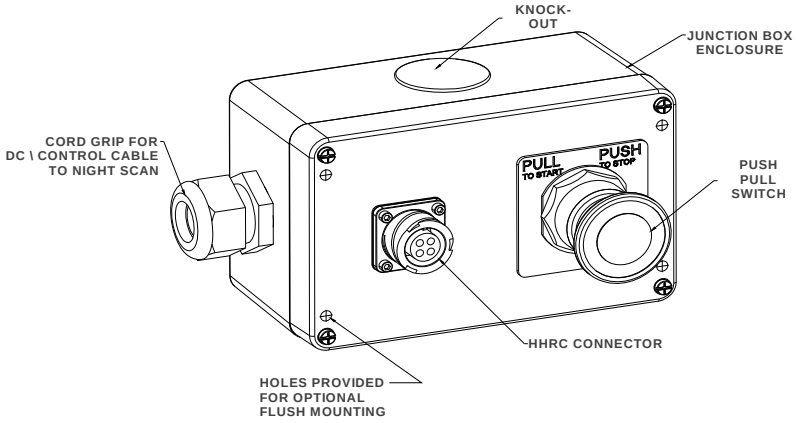

Figure 2-3 Standard Junction Box

Flush Mounting

For a flush mount installation, four #8 screws, nuts and lock washers must be provided by the installer. The screw length should be 3 ½ inches plus the panel thickness. Remove the junction box cover and make the necessary cable connections (see schematics in section 4.4). Place the junction box behind the panel and guide the screws through the panel, junction box cover and junction box. Secure on back side using lock washers and nuts.

Surface mounting

For a surface mount installation, four #8 screws, nuts and lock washers must be provided by the installer. The screw length should be ¾ inch plus the panel thickness. Remove the junction box cover and mount unit through the counter bored holes in the junction box. Secure on the back side using lock washers and nuts. Make the necessary cable connections (see schematics in section 4.4) and replace cover.

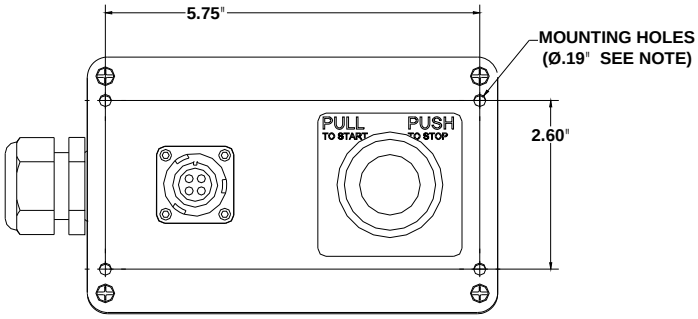

Figure 2-4 Junction Mounting Hole Locations

2.5 CONNECTING THE PUSH/PULL SWITCH (JUNCTION BOX)

While a two switch implementation of this circuit can be realized, the use of a Push/Pull switch is highly preferred. One switch available for non-NFPA installations is a Square-D 9001KR9RH13. For NFPA compliant installations, Square-D part number 9001SKR8RH25 should be used. Other manufacturers of Industrial Control Pilot Devices should have equivalent switches. This switch is available as part of a pre-wired kit (part # 913316 for NFPA or part #4204201 for non-NFPA installations) from Will-Burt. Refer to the schematics in section 4.4 for wiring detail.

2.6 CONNECTING THE REMOTE CONTROL(S)

Hand Held Remote Control (HHRC)

In the event that the accessory kit (part # 913316 or 4204201) is not used, a suitable connector must be supplied by the customer to mate with the connector of the handheld remote control (HHRC). The connector on the HHRC is an ITT Cannon CA3106E14S-2P-B-F80-A232. Please refer to Table 2-2 and Figure 4-7 for wiring schematic.

Pin B of the HHRC should connect to pin A of the DC Power/input connector. Pin C of the HHRC should connect to pin B of the DC Power/input connector. Pin A of the HHRC should connect to pin C of the DC Power/input connector. Pin D of the HHRC should connect to pin D of the DC Power/input connector.

Table 2-2. Handheld Remote Control Connector Pin-out

HHRC Pin	Pin Function	To Pin of DC Power Connector	Recommended Wire Ga.
A	+ Signal	C	20
B	+ Power	A	20
C	- Power	B	20
D	- Signal	D	20

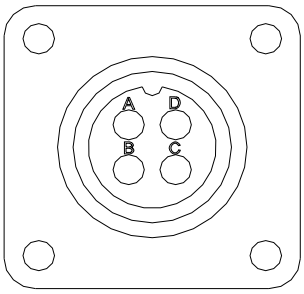

Figure 2-5 Hand Held Receptacle Pins

2.7 CONNECTING THE INTERLOCK CONTACT (OPTIONAL)

The Chief provides an interlock relay contact output to enhance integration into vehicle safety circuitry. This relay output is from a bi-stable (latching) relay whose contacts close when the unit has completely stowed. This type of scenario gives the best failsafe condition in the event of a broken wire. Its state is not affected by whether or not there is power to the mast. This isolated contact is capable of carrying up to 2 amperes and is available on pins J4-8 and 9. Please refer to the schematics in section 4.4. Its usage is at the discretion of the integrator. It can be used in conjunction with a customer-supplied relay to drive a flashing warning light. (refer to Figure 2-6)

2.8 CONNECTING INTERLOCK INPUT CONTACTS (OPTIONAL)

Some customers may require preventing operation of the Chief unless other conditions are first met. An example might be having the parking brake set. This can be accomplished by inserting an isolated contact in series with the stop circuit of the Push/Pull switch. Inserting these contacts between the violet wire connected to pin J4-6 base circuit board and the KA-1 contact of the Push/Pull switch breaks continuity and thus will immediately stop operation of the Chief and prevent further operation until continuity is restored through the contacts. Please refer to the schematics in section 4.4.

2.9 INSTALLING THE WARNING LIGHT

As required by NFPA regulations, a red flashing or rotating light, located in the driving compartment, must be automatically illuminated whenever the vehicle parking brake is not fully engaged and the light tower is extended. The warning light is wired into the system via the interlock contact described above. A customer provided, normally closed pilot relay should be installed on pins J4-8 and 9 of the base circuit board. See the wiring schematics in section 4.4. A customer supplied flashing relay and lamp may then be installed in the driving compartment such that the driver can see the lamp. One example using a Bosch relay is shown below.

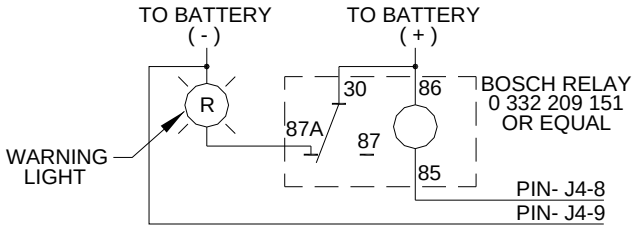

Figure 2-6 Example of Warning Light Installation

2.10 MULTIPLEX SYSTEMS OPERATING AT 24 VOLTS

When operating at 24 volts, the Night Scan Chief “chops” the voltage sent to the 12 vdc motors is the system. As a result of this starting and stopping, voltage might be fed back through the power wires and into the power supply. In some instances, this may lead to unexpected behavior in a multiplex system. In order to mitigate this back feeding of voltage, an 820uF capacitor (Will Burt Part Number 204001) can be placed across the positive and negative input terminals (TB3-5 and TB3-6) on the base circuit board. Please refer to wiring schematic Figure 4-8. Note the direction of the capacitor for installation.

2.11 PRE-OPERATIONAL CHECK

⚠ WARNING

Before beginning installation, make certain that the area is free of overhead power lines and other unwanted sources of electricity. Follow OSHA safety regulations when working near energized power lines. Be sure to allow sufficient clearance on all sides of mast to allow for side sway.

⚠ WARNING

For outdoor use only. Do not use in areas that have been classified as hazardous as defined in Article 500 of the National Electric Code.

⚠ WARNING

Do not use in the presence of flammable gases or liquids such as paint, gasoline or solvents. Do not use in areas of limited ventilation or where high ambient temperatures are

present. Contact with combustible materials can cause ignition resulting in fire or explosion.

Before operating the Chief, be sure that there are no overhead obstructions and that there are no power lines within 20 feet of the mast. Visually inspect the unit for any damage. If damage is apparent, do not use the mast. Have it serviced prior to use. Check for any objects which might obstruct motion of the mast or cause binding. Remove any material that may hinder mast function.

CHAPTER 3
OPERATING INSTRUCTIONS

⚠ WARNING

All operators must read the Operation section of this manual and be properly trained.

⚠ WARNING

Keep personnel clear of mast while during operation.

⚠ WARNING

For outdoor use only. Do not use in areas that have been classified as hazardous as defined in Article 500 of the National Electric Code.

⚠ WARNING

Do not use in the presence of flammable gases or liquids such as paint, gasoline or solvents. Do not use in areas of limited ventilation or where high ambient temperatures are present. Contact with combustible materials can cause ignition resulting in fire or explosion.

⚠ WARNING

Before operating, make certain that the area is free of overhead power lines and other unwanted sources of electricity. Be sure to allow sufficient clearance on all sides of mast to allow for side sway.

⚠ WARNING

Do not move vehicle until mast has been securely stowed.

3.1 THEORY OF OPERATION – MECHANICAL

Night Scan Chief – Mast

The Night Scan Chief operates using a DC powered actuator to drive the mast from nest to 90 degrees. When at 90 degrees, a magnetic sensor detects the actuator position and prevents further driving of the actuator. The sensor also notifies the operator through the Remote Control(s) that certain RCP functions are available. The compressor assembly included in the base will receive power and pressurize the mast when the up button is depressed. If, at any time, power to the unit is lost, the exhaust valve opens, exhausting all air from the mast.

As the mast is nested, the base control looks for indication from a magnetic switch that the mast has fully retracted and may be safely restored to its fully nested (horizontal) position. If the “double click” unattended stow sequence was not used, the RCP will begin the autostow sequence to insure that the RCP is properly positioned for engagement with the saddle. If the autostow “double click” sequence was used, the RCP will have properly positioned itself as the mast descended prior to horizontal nesting into the saddle.

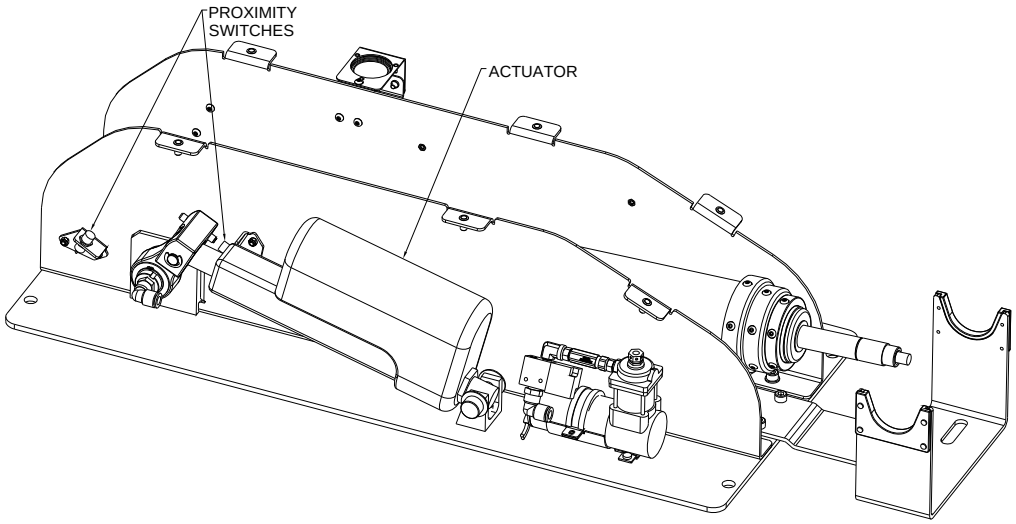

Figure 3-1 Actuator and Proximity Sensors

RCP

The RCP provides pan and tilt functions upon command from the Remote Control(s). DC powered gear motors turn the shafts until an opaque flag in the assembly reaches a photo interrupter. At this time, the LED on the Remote Control(s) for that direction of travel will go out, indicating that a limit has been reached in that direction.

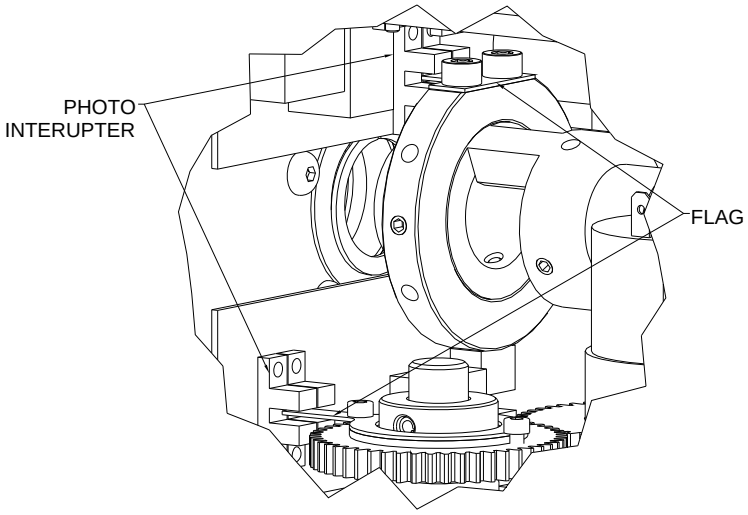

Figure 3-2 Photo Interrupter and Flag

3.2 THEORY OF OPERATION – ELECTRICAL

The Chief control is based on a distributed intelligence control structure. Each main section of the Chief has a circuit board with an embedded micro controller. These sections are: the Base, the RCP, and the Remote Control(s). These boards “talk” to each other over a multi-drop RS-485 serial communications link.

Another key component of the control is an initialization circuit. In an NFPA compliant installation, a completely stowed Night Scan Chief draws zero current and cannot be extended or operated until the initiate circuit is engaged. Included in this initialization circuit is an input for a safety interlock. This can be used for an emergency stop, or other interlock function such as a “Park/Neutral” switch from the vehicle transmission. Relay contacts inserted in the violet wire coming from pin J4-6 of the base circuit board function to inhibit operation of the Chief (See schematics in section 4.4)

Additionally, a bi-stable (latching) contact closure is provided that indicates that the mast is properly stowed. It will close when the mast is properly stowed. If the mast is not stowed, the contact will be open. Even if the emergency stop feature is used prior to the mast completely stowing, the contact will still remain open. If the Night Scan has been stopped using the emergency stop button or by some other interruption of power, the initiate circuit will need to be activated again in order to continue operation.

When stowing the mast to horizontal position, the control monitors the current of the actuator. When the mast lowers, trips the Mast Nested limit switch, and comes up against the mechanical resistance of the saddle; it senses it, considers itself stowed, and shuts itself down. This ensures a certain amount of pre-load on the RCP saddle.

If at any time during the operation of the mast an unexpected control situation occurs, the mast will stop any movement and a fault message will be displayed on the Remote Control(s) display. Clearing the fault is accomplished by pushing the Push/Pull switch or momentarily interrupting power in some other way. Then the control may be re-initiated and operated again.

3.3 PUSH/PULL SWITCH – NFPA INSTALLATIONS

All operation of a completely stowed mast must be preceded by proper initialization. The initiate switch must be momentarily closed to power-up the Night Scan. When the Will-Burt Accessory Kit is used, the Push/Pull switch is located on the junction box. It is used to perform two functions. First, it can be used to “initiate” the

control by pulling the switch operator. This is a momentary function, and the switch will return itself to a neutral position on its own. Secondly, it functions as an emergency stop when the switch operator is pushed all the way in. This is also a momentary function, and the switch will return itself to a neutral position on its own. When using Will-Burt's accessory kit push/pull switch, accidental initiating is extremely unlikely since it would require pulling the switch button. Even with this, the Remote Control(s) would have to be subsequently pushed to get any action. In the unlikely event that the initiate switch were engaged, the Night Scan will power itself down if no Remote Control action occurs within thirty seconds. The "Push" portion of the Push/Pull switch functions as an Emergency Stop. If it is pushed, the mast will immediately be disconnected from power and stop. **It should be noted that prematurely disconnecting power in this way will immediately cause the mast to vent.** Other interlock contacts could be inserted into this circuit to provide additional safety. The control also monitors the initiate input, and if it sees that this input is present for a prolonged period of time; the control will stop the mast and appropriate error code will be displayed (Err, 1.09). This is a preventative measure to ensure the initiate input is not hot-wired. Once the mast has been initiated, the Remote Control must then be used to begin raising the mast within thirty seconds or the control will shut itself down. If the mast has been initiated and raised any amount, the control will remain powered until the mast is fully stowed, the emergency stop function is used, or the power is somehow otherwise interrupted.

3.4 PUSH/PULL SWITCH – NON-NFPA INSTALLATIONS

All operation of a completely stowed mast must be preceded by proper initialization. The initiate switch must be closed to power-up the Night Scan. When the Will-Burt Accessory Kit is used, the Push/Pull switch is located on the junction box. It is used to perform two functions. First, it can be used to "initiate" the control by pulling the switch operator. Secondly, it functions as an emergency stop when the switch operator is pushed all the way in. When using Will-Burt's accessory kit push/pull switch, accidental initiating is extremely unlikely since it would require pulling the switch button. The "Push" portion of the Push/Pull switch functions as an Emergency Stop. If it is pushed, the mast will immediately be disconnected from power and stop. **It should be noted that prematurely disconnecting power in this way will immediately cause the mast to vent.** Other interlock contacts could be inserted into this circuit to provide additional safety.

3.5 REMOTE CONTROLS (HAND HELD)

Wired Hand Held Remote Control

- The Remote Control accepts switch activations from the operator and translates them into serial commands for transmission to the base control board via the RS-485 link. If the operator engages a switch, the Remote Control will appropriately send commands repeatedly as long as the operator continues to engage that switch. The Base control will pass along appropriate serial commands to the RCP in response to the Remote Control(s). Additionally, various states of the system will be passed to the Remote Control so that button status LEDs can give proper indication of the state of the Night Scan. An example of this is that the LED next to the "Mast Down" button will not be lit unless it is appropriate to lower the mast. Upon first beginning to raise the mast, it will be noted that the "Mast Down" button does not become active until a certain amount of movement has been accomplished. This is to ensure that there is enough downward travel available for proper stowing of the mast. If the button status LED for a particular button is not lit, that button will not function. Another reason for a button status LED not being lit could be an actuator reaching the extent of its travel (or limit switch).
- Two special functions are implemented in software whereby the operator can initiate an unattended lowering and stowing of the mast, or an unattended partial raising of the mast. The Autostow is accomplished by two rapid sequential activations of the "Mast Down" button within a half second period of time. This automatic unattended sequence can be aborted at any time by a single activation of the "Mast Up" button or any other button on the Remote Control(s). The

Auto-Up function is accomplished by two rapid sequential activations of the “Mast Up” button within a half second period of time. This automatic unattended sequence can be aborted at any time by a single activation of the “Mast Down” button or any other button on the Remote Control(s). The Auto-Up function will only bring the Chief from the horizontal stowed position up to the 90º position and turn the lights on. It will not raise the mast any further vertically on its own. The Auto-Up function is not available on the non-NFPA Chief.

Wireless Held Remote Control

- The wireless remote control accepts switch activations from the operator and transmits to the base control board. If the operator engages a switch, the Remote Control will appropriately send commands repeatedly as long as the operator continues to engage that switch. The Base control will pass along appropriate serial commands to the RCP in response to the Remote Control(s). Feedback in the form of LED’s is not available with the wireless remote control.

3.6 RAISING THE MAST

Operation of the mast using the Remote Control(s) is fairly intuitive. A typical operational sequence could be as follows:

- Pull the Push/Pull Initiate button.
- Press and hold the “Mast Up” button on the Remote Control(s) until the mast has fully extended.
- Press the desired Pan and Tilt buttons until the lights are facing appropriately.
- Press the Light and Aux light buttons momentarily to turn the desired lights on and off.
- Press the “Mast Down” button until the mast has completely stowed.

Note: In the Night Scan Chief, during the process of raising the mast, the mast will first be inclined to a position perpendicular to its mounting surface by an actuator. Once the control senses it is in this position, air pressure will be applied to the tube sections to raise the mast further into the air. Lowering the mast is in reverse order. Air is vented from the tube sections reducing its height. Then the actuator declines the mast until it is finally stowed.

Auto-up Function (wired handheld remote control only)

The “Auto-up” function can be initiated by giving two quick successive depressions of the “Mast Up” button (within ½ second). The mast will then raise to the 90° position and automatically turn on both banks of lights. This automatic sequence can be aborted by pushing any of the buttons on the Remote Control(s) at any point during the Auto-up sequence. The mast will not extend up by itself, but will await further operator input from the Remote Control(s).

3.7 AIMING THE REMOTE CONTROL POSITIONER

The positioner can be “aimed” by utilizing the pan and tilt buttons located on the Remote Control(s). The Pan Left and Pan Right buttons allow horizontal movement, while there are independent Tilt Up and Tilt Down functions for vertical adjustment of each side of the RCP.

3.8 STOWING THE MAST

There are two methods of stowing the mast. The normal method involves pressing and holding the “Mast Down” button until the mast is fully stowed and the control shuts itself off. A second method, available on

the hardwired remote control) involves giving two quick successive depressions of the “Mast Down” button (within ½ second). This will initiate an unattended complete stowing of the mast. This Auto-stow mode can be interrupted and canceled at any time by pressing any of the buttons on the Remote Control.

Note: To ensure proper seating of the RCP in Night Scan Chief saddle, the control watches for an increase of current from the actuator. Once this has been satisfied, the control will shut itself off on NFPA compliant installations. For non-NFPA installations, it will be necessary to manually shut off power by pushing the Push/Pull switch on the junction box. If by chance there is no increase in current and the actuator shuts off because of its internal limit switch, a fault message will be displayed.

Once the control is shut off, the Night Scan is totally disconnected from power, and the “Mast Stowed” safety interlock contact closes signaling it is safe to move the vehicle. **Be sure that no buttons are illuminated on the remote after you believe it is stowed. Illuminated buttons indicate that the unit is <u>not</u> stowed.** After making certain that the unit is properly stowed in the saddle, unplug the remote control and stow it where it will not be damaged in transport. Unplugging the remote will remove any possibility that the Chief could become active and extend unexpectedly.

3.9 EMERGENCY STOW (LOSS OF POWER):

⚠ WARNING

Make sure all power has been disconnected from the Night Scan prior to manually lowering mast.

⚠ WARNING

Make sure lights have cooled completely before manually panning or tilting the RCP.

In the event of power loss or an unrecoverable error condition, the Night Scan Chief will automatically exhaust all air and nest. However, the mast will NOT return to its fully stowed, horizontal position. This must be accomplished manually. It is required that two people perform this operation as the mast is very heavy and can cause severe injury or death if not done with extreme caution. It may be necessary to manually pan the RCP so that when it is manually nested, the lights do not make contact with the mounting surface or the saddle. To manually pan the unit, firmly grasp the RCP by the horizontal shafts and **slowly** rotate to a point perpendicular to the length of the base. Additionally, it may be necessary to manually tilt the lights to prevent damage when stowing the mast. Tilt the lights by grasping the top and bottom of the light bar and **slowly** rotating the lights such that they face down when fully stowed.

⚠ WARNING

Support the mast before removing shoulder screw! Once removed, the mast and light assembly is free to fall.

Remove the right side base cover (opposite look up light). Secure the mast in an upright position to prevent it from falling freely. Remove the knurled shaft from the bottom of the actuator. CAREFULLY lower the mast down into the saddle. Secure the mast in this nested position before moving the vehicle.

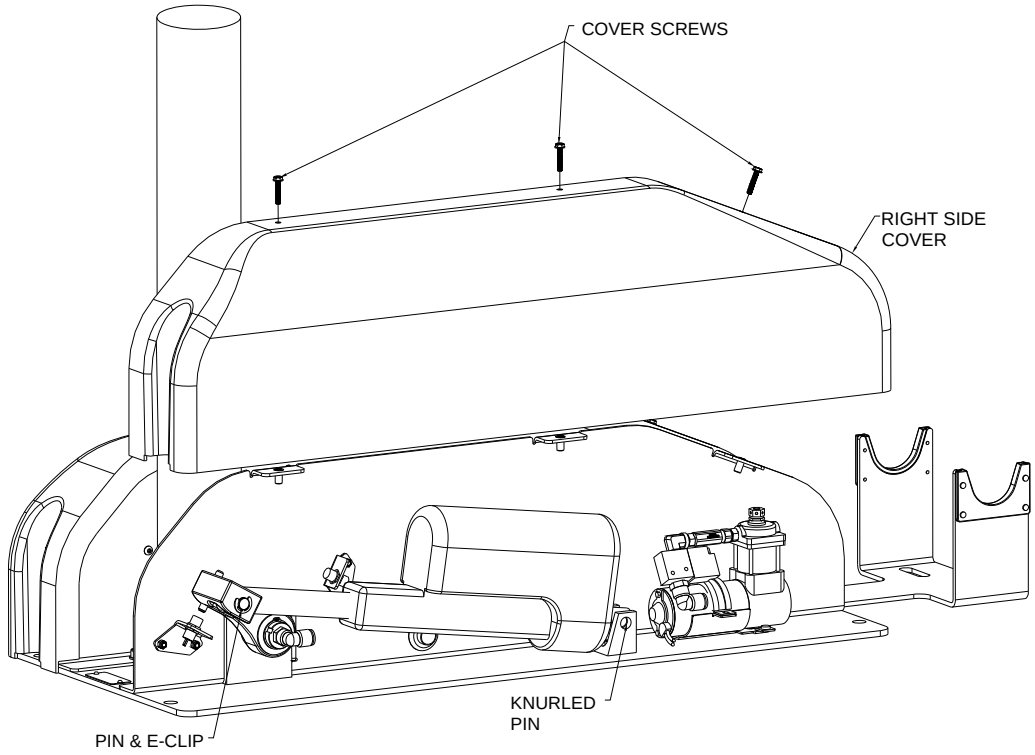

Figure 3-3 Cover and Screw Removal for Manual Stow (Night Scan Chief only)

CHAPTER 4
MAINTENANCE AND SERVICE INSTRUCTIONS

4.1 INTRODUCTION

This section of the manual describes routine maintenance procedures and covers general service information. Refer to Chapter 5 for exploded views of the Night Scan Chief and the accompanying Tables with item descriptions and part numbers, which may be used for ordering replacement parts.

4.2 SCHEDULED MAINTENANCE

Cleaning and Lubrication - Mast

Will-Burt pneumatic telescoping masts should be cleaned and lubricated on a regular basis to insure smooth operation and to prolong useful life. This maintenance should be performed typically about once a month depending upon local environmental conditions and frequency of use. Signs that cleaning and lubrication are needed can be:

- A noticeable gritty film on the exterior surfaces of the mast sections
- Erratic extension or retraction of the mast
- Noisy operation of the mast
- Sticking of one or more mast sections when mast is extending or retracting

⚠ WARNING

A pneumatic telescoping mast is a pressure vessel. Caution must be exercised to stay clear when the mast is being extended. Do not lean directly over the mast. Proper eye protection should be worn when working on the mast.

PROCEDURE:

1. One person operating hand held remote control should slowly pressurize the mast just enough to extend the top mast section. Another person may need to hold down the larger mast section collars to assure the proper sequence of extension. Release “Mast Up” button as soon as the mast section is up.
2. Wipe down the extended mast section using a non-abrasive cleanser or solvent such as lacquer thinner. Do not allow the cleaning fluid or solvent to run down inside the collar.
3. Repeat steps 2 and 3 for the next larger mast section.
4. Inject approximately 1/2 oz. of TMD Mast Lubricant* or a lightweight machine oil into the weep hole (drain) of the exposed mast section. The weep holes are located approximately 10 inches below the collar on each tube except the top one.
5. Repeat steps 2, 3 and 5 for each of the remaining mast sections.

6. Exhaust the mast completely. Allow several minutes for the lubricant to settle and spread around the wear ring and seal at the bottom of each mast section.

⚠ WARNING

Keep hands clear of the descending collars while the mast is being lowered to avoid pinching.

7. Extend the mast again one section at a time in the same sequence (smallest to largest). Wipe off any excess lubricant which flows out of the weep holes.

   NOTE: Do not lubricate the exterior of the mast, as this will cause it to attract dust and contaminants from the air.

* TMD Mast Lubricant is specifically formulated for cold weather use, but is suitable for year around use. Regular winter maintenance and the frequent use of TMD Mast Lubricant should significantly reduce the potential for mast freeze ups.

Cleaning Night Scan Base and Remote Control Positioner (RCP)

⚠ WARNING

Make sure lights are completely cool before attempting to clean.

The exterior of the RCP and Night Scan base should be wiped down periodically to remove dirt and road grime using a soft cloth or sponge and a mild solution of soapy water. The lenses of the lights should be cleaned using standard glass cleaner and a soft towel.

4.3 ADJUSTMENTS

Adjusting the 90º Proximity Switch

The proximity switch (sensor) is intended to stop the actuator when the mast is at 90 degrees when being raised. It senses the magnet that is threaded into the clevis and signals the base circuit board to cut power when the actuator is in the correct position. In the event that this switch needs adjusted (i.e. after replacing the actuator) to stop the mast at 90 degrees, the following procedure must be followed. Use Figure 4-1 as an aid to identify the components.

1. Make certain that the Chief is level.
2. Remove the right hand base cover (opposite the look up light)
3. Loosen the upper jam nut to lower the switch approximately 1/8".
4. Raise the mast to 90 degrees. Verify that the mast is plumb using a level or check to see that it is square to the sheet metal side plate on the base.
5. Raise the switch until it senses the actuator. This will be indicated by 1) an audible "click" of the exhaust valve closing, 2) lights on the hand held will change state, indicating that RCP functions are available and 3) the LED on the base circuit board will change from green to yellow.
6. Secure the switch in position using the upper and lower jam nuts.

7. Cycle the mast several times, checking that the mast is plumb each time. Adjust the switch if necessary.
8. Replace cover.

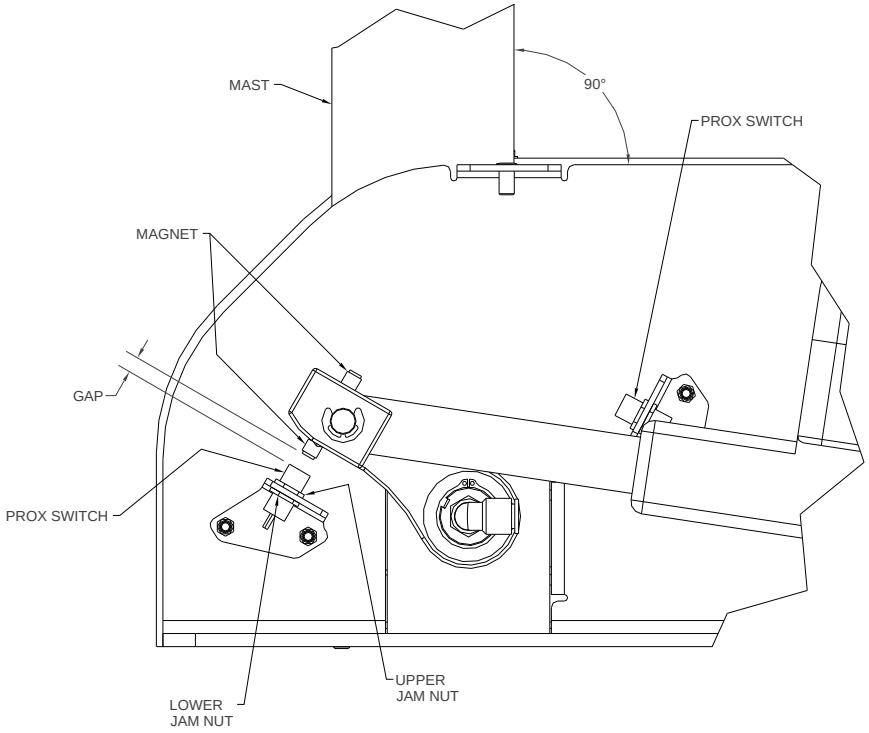

Figure 4-1 Proximity Switch Adjustment

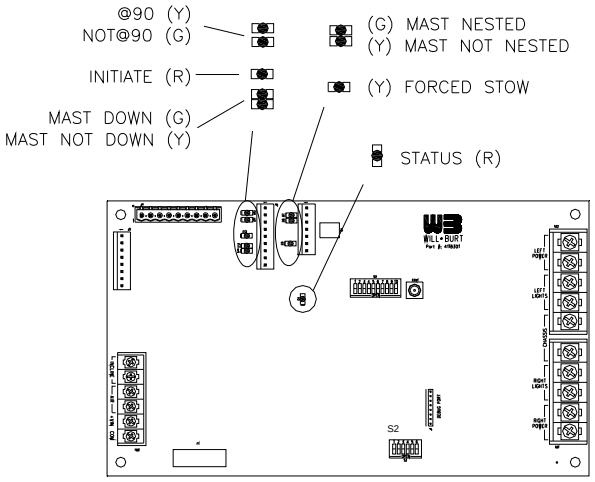

Figure 4-2 LED Location and Function

Adjusting the Magnetic Switch

The Magnetic Switch is located on the mast base tube. In the Night Scan Chief, the magnetic switch senses a magnet located in the top tube and serves to indicate that the mast has exhausted all air and that it is safe to nest into the saddle. If the switch is out of adjustment, it will prevent the mast from nesting to the saddle from the 90 degree position. **It is important that the mast has properly nested by verifying that the collars are stacked with no gaps between them.** If the collars are not properly stacked see Table 4-5 for further instructions. If the switch is found to require adjustment, it will most commonly need to be moved upward (toward the RCP) on the mast. The magnet is located at the lower end and side of the top tube. It is not visible outside the mast.

The following procedure must be followed to adjust the magnetic switch.

1. Loosen the band clamp securing the switch to the base tube. Move the switch up approximately 1/8" and tighten band clamp.
2. Initiate the mast, if necessary, and press the down button the hand held remote. If the mast does not nest, repeat the adjustment until it does. A small piece of steel or iron filings may be used to help locate the magnet.
3. If repeated attempts do not succeed, hold a magnet up to the switch and press the down button. If the mast begins to nest, continue repeating the adjustment until the switch has sensed the magnet.
4. If the mast will not nest when a magnet is held to the switch, check the wiring to the circuit board for loose or disconnected wires. See schematics in section 4.4. If the wiring is intact, replace the magnetic switch.

Resetting the RCP Home Position

The Chief unit is shipped with the lights in home position. Home position is established by setting small flags in the RCP that engage photo interrupters on the RCP board. It orients the lights such that the light bars are parallel to the axis of the mast and are facing downward when nested. On all models, the RCP shafts should contact the saddle simultaneously during nesting when correctly set. It should be noted that having the RCP covers off could cause improper RCP operation when outdoors. This procedure should be performed indoors. To set the home position, the following procedure must be observed.

1. **DISCONNECT ALL AC POWER TO THE CHIEF!**
2. Initiate the mast and raise it to the 90-degree position. The hand held remote should show both left and right tilt up functions are available and the pan left function is available.
3. Remove the RCP covers to access the flags.
4. Refer to Figure 4-3 for reference. The flags are attached to the timing rings on the horizontal and vertical shaft gears.
5. Once the set screws are loose, pan and tilt the unit to the correct home position. Be careful that the flags do not come into contact when panning and tilting, they may become bent.
6. It is important that the flags engage the correct photo interrupter when setting the home position, see Figure 4-3. Turn the timing ring on the right horizontal shaft such that it rotates down toward the upper photo interrupter. As you approach the interrupter, watch the wired hand held remote. As soon as the tilt down LED goes out, stop rotating the ring and tighten the set screw. To set the pan home position, turn the timing ring counterclockwise (looking from above the RCP) until the pan right LED goes out. Tighten the adjustment screw to secure the ring.
7. Pan and tilt the unit until the second set screw in each ring is accessible and tighten.
8. Stow the mast, watching for the lights to be oriented as described in the beginning of this section.

9. Initiate and raise the mast to 90 degrees. Replace the RCP cover.

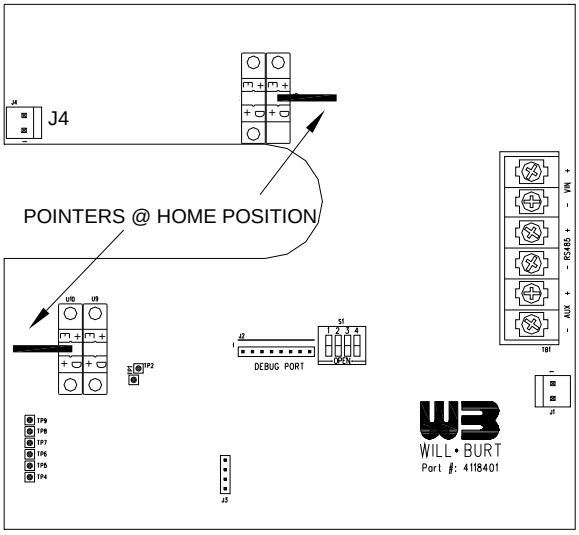

Figure 4-3 Flag Settings

DIP switch setting

Chief base boards require that the DIP switch be set appropriately to determine operational mode. RCP boards require that the DIP switch be set appropriately to determine operational mode. This takes the place of setting the operational mode through software by changing a variable.

To set the operational mode for the Base board, locate the DIP switch S2 (see Figure 4-4) and set the DIP switch as follows:

- Position 1 - DO NOT CLOSE
- Position 2 - Close if the system is a non-NFPA compliant installation
- Position 3 - Close if the system does not have an RCP
- Position 4 - DO NOT CLOSE
- Position 5 - DO NOT CLOSE
- Position 6 - DO NOT CLOSE

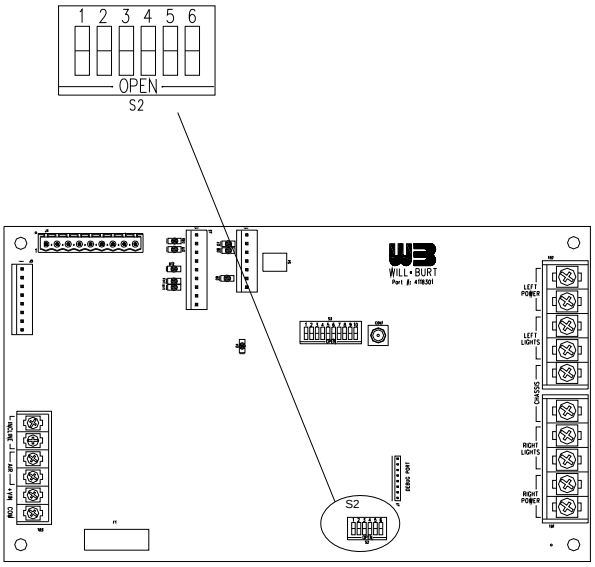

Figure 4-4 DIP switch location: Chief base board

To set the operational mode for the RCP board, locate the DIP switch S1 (see Figure 4-5) and set the DIP switch as follows:

- Position 1 - Close to cause the RCP to self stow if there is an error.
- Position 2 – DO NOT CLOSE.
- Position 3 – DO NOT CLOSE
- Position 4 – DO NOT CLOSE

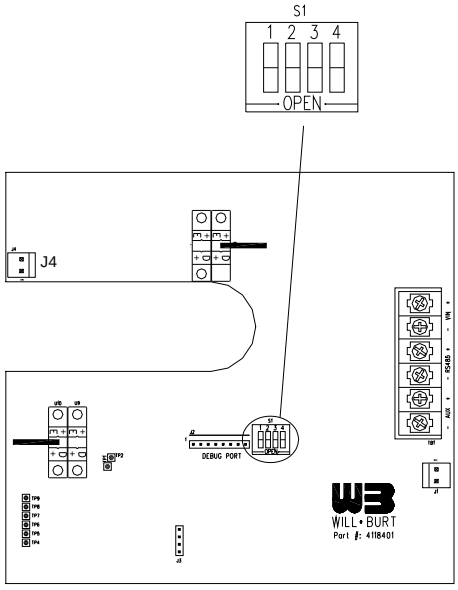

Figure 4-5 DIP switch location: Chief RCP board

4.4 SYSTEM SCHEMATICS

A system schematic is given in order to aid in electrical troubleshooting as outlined in the following section.

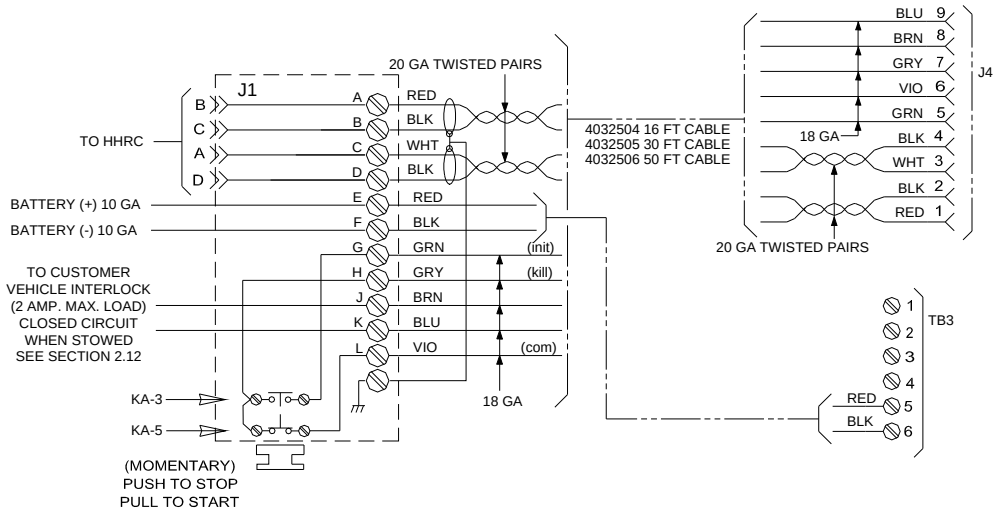

Figure 4-6 NFPA Handheld Remote Wiring

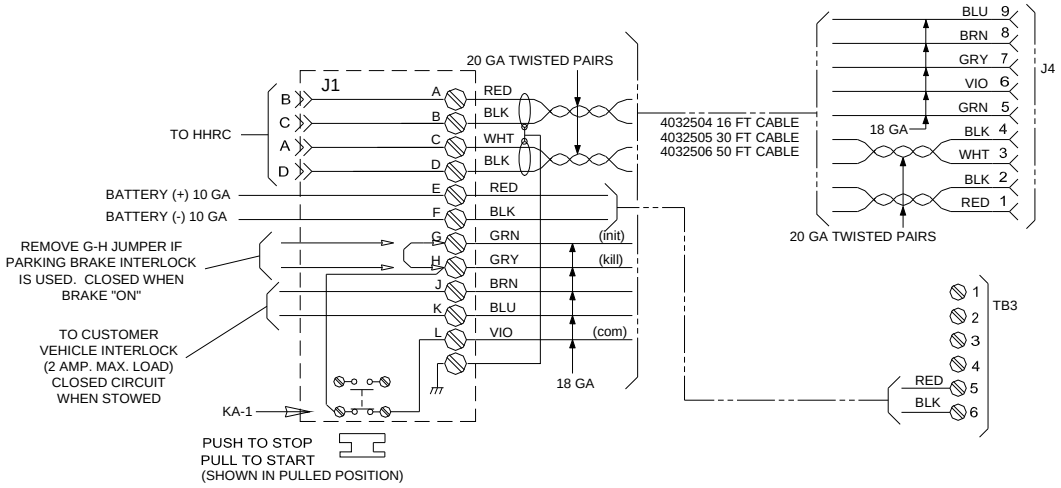

Figure 4-7 Non-NFPA Hand Held Remote Wiring

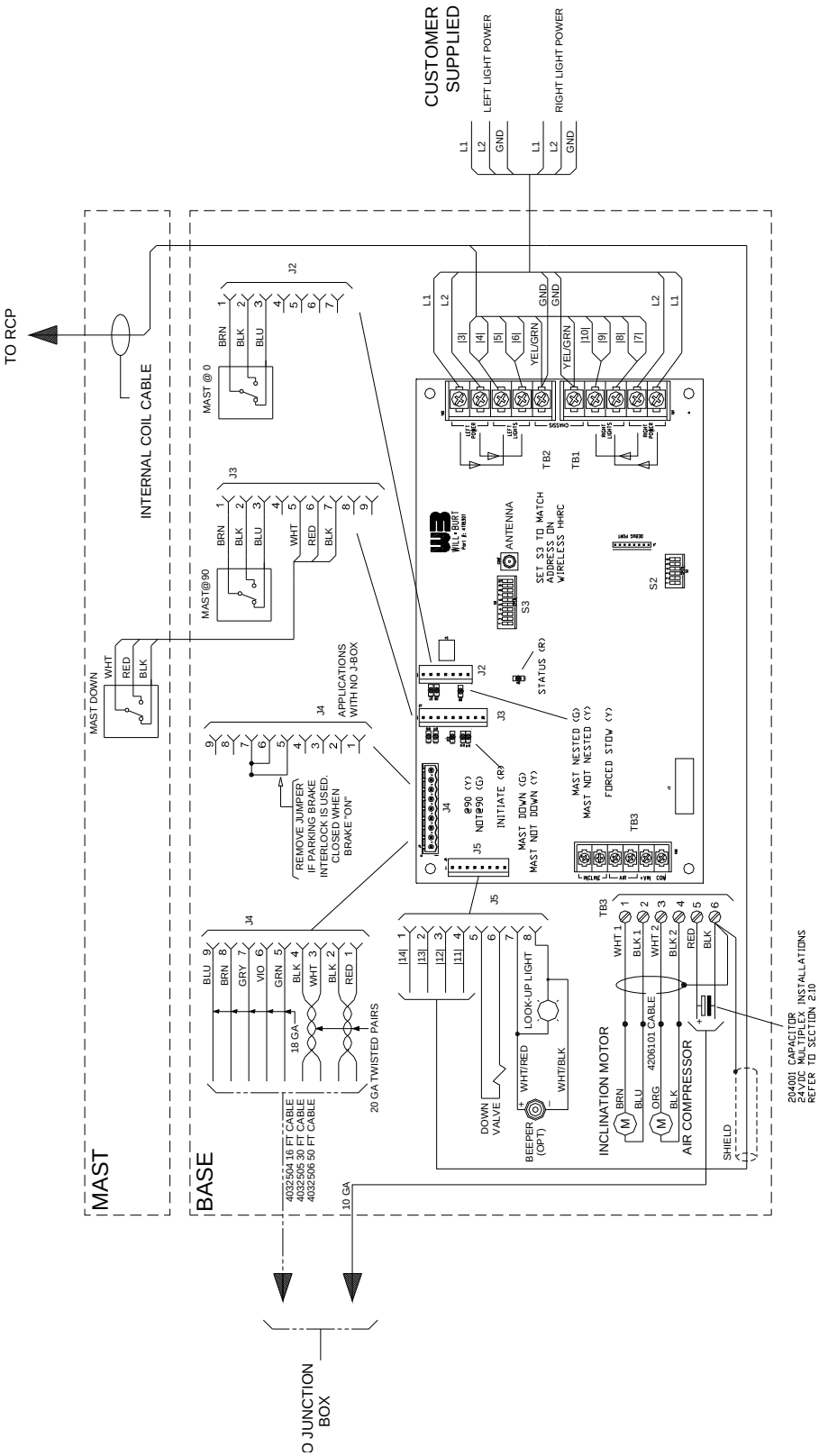

Figure 4-8 Night Scan Chief Base Wiring

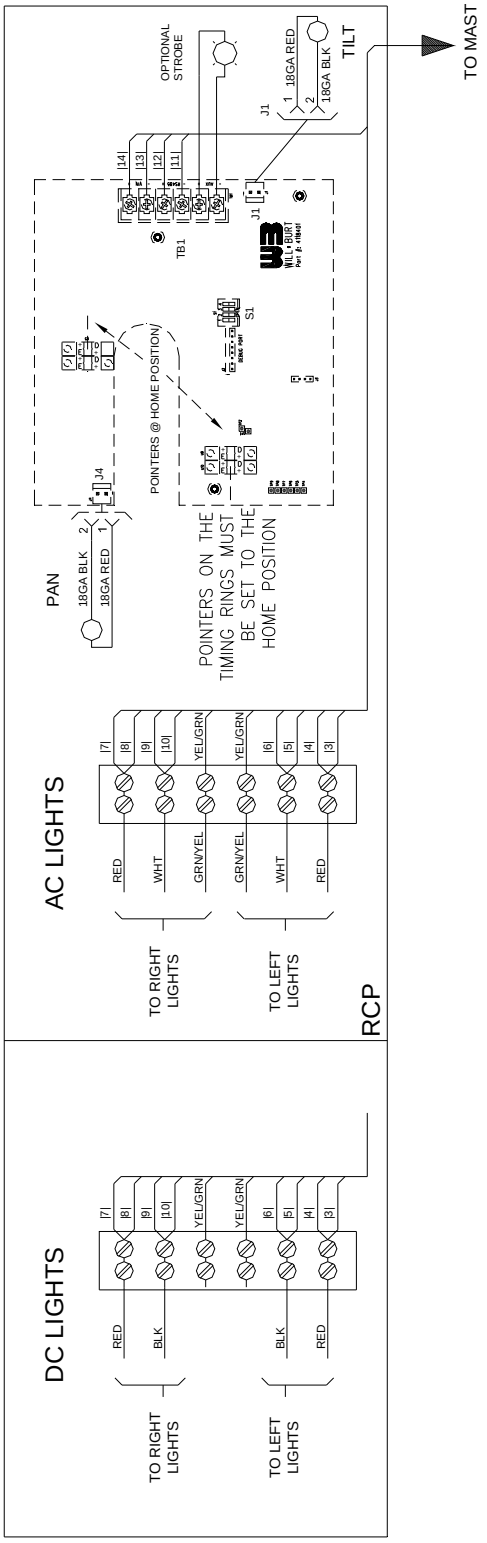

Figure 4-9 Night Scan Chief Remote Control Positioner (RCP) Schematic

4.5 TROUBLESHOOTING ELECTRICAL

Operating Environment

One of the most common causes of improper operation is trying to operate outside of the stated system requirements. (See section Table 1-1for DC power requirements). A good method of checking the voltage at the Chief is to connect a voltmeter to the wires in the junction box powering the Remote Control(s) (pins B and C of J1 (see schematics in section 4.4). This will give a good indication of power loss across the DC cabling. For long runs, it may be necessary to add an intermediate junction box in the DC cable so that DC power can be applied closer to the Chief.

Fault Codes

Fault codes are presented on the LED alphanumeric display on the wireless remote control. When faults occur, all operation ceases. Faults may only be cleared by killing power to the Chief. This may be accomplished by momentarily pushing in the Push/Pull switch and then re-initializing. Additionally, the fault code is also flashed by a red status LED located on the Base board. For instance, if the fault code were 3,07, then the LED would flash three times, pause, flash seven times, pause longer, and the repeat the flash sequence. During normal operation, the LED should flash a slow steady on/off pattern. The codes are as follows:

4.5.1.1 Base Board

The Base board is located in the base of the mast and is assigned unit number one (1). The Base board may generate the messages of Table 4-1:

Table 4-1. List of Base Board Faults

Message	Meaning	Root Issue	Potential Causes
Err 1,01	Mast Down Magnetic Switch Wiring Error	The Mast Down Magnetic Switch appears to have its complimentary outputs wired backwards This switch is located on the side of the mast.	This check is only made at power-up when the mast thinks it is nested. The wires on pins 5 and 6 of J3 may need to be swapped. The magnetic switch not being energized could also cause it. Place a magnet close to the switch to check before changing wiring.
Err 1,03	Excessive actuator current draw during nesting	The current drawn by the actuator has exceeded a level of current greater that that required for proper nesting	Either a rigid object is in the way of the mast as its nesting, or the Mast Nested Proximity Switch is not being activated as the mast approaches the saddle. Check for foreign objects in the

			mast path, and confirm that the proximity switch is being properly activated.
Err 1,07	Unrecoverable Communication Error	The Base board has not sent out communications recently	Indicates a software problem. Notify Will-Burt
Err 1,08	Software Fault	Internally detected error	Indicates a software problem. Notify Will-Burt
Err 1,09	Initiate Pushbutton	The Initiate input has been closed for too long.	Wiring Short in the DC cable or incorrect DIP switch setting (S2)
Err 1,10	EEPROM Life	More than 20,000 writes have been made to a particular EPROM location	Will only occur when the mast has had in excess of 20,000 cycles which is unlikely to happen. Replace the base board.
Err 1,11	Saddle Location	The internal linear actuator limit switch has opened before preload occurred	The saddle is too low with respect to the Chief base. Shim the saddle up as needed. Refer to section 2.4 for flatness requirement.
Err 1,12	Actuator 90° Proximity Switch Disagreement	The proximity switch sensing the mast actuator at 90° has conflicting complementary outputs.	There may be a wiring problem, or a defective proximity switch. Check the voltages at J3 pins 1 and 3 with respect to pin 2. These two voltages should be opposite of each other as the proximity switch is activated and inactivated. The voltages should be close to battery voltage or close to ground. If they are not, replace the actuator 90° proximity switch. Refer to system

			schematics in section 4.4
Err 1,13	Mast Nested Proximity Switch Disagreement	The proximity switch sensing the mast actuator at almost nested position has conflicting complementary outputs.	There may be a wiring problem, or a defective proximity switch. Check the voltages at black and white wires with respect to the blue wire. These two voltages should be opposite of each other as the proximity switch is activated and inactivated. The voltages should be close to battery voltage or close to ground. If they are not, replace the actuator almost nested proximity switch. Refer to system schematics in section 4.4
Err 1,14	Mast Down Magnetic Switch Disagreement	The magnetic switch sensing the mast is lowered (referring to tube set) has conflicting complementary outputs.	There may be a wiring problem, or a defective proximity switch. Check the voltages at J3 pins 5 and 7 with respect to pin 6. These two voltages should be opposite of each other as the magnetic switch is activated and inactivated. The voltages should be close to battery voltage or close to ground. If they are not, replace the Mast Down switch. Refer to system schematics in section 4.4
Err 1,15	Actuator 90° Proximity Switch Wiring Error	The proximity switch sensing the mast actuator at 90° appears to have its complimentary	This check is only made at power-up when the mast thinks it is nested. The wires on pins 1

		outputs wired backwards	and 3 of J3 may need to be swapped. The proximity switch not being energized could also cause it. Place a magnet close to the switch to check before changing wiring. Refer to system schematics in section 4.4
Err 1,16	Mast Nested Proximity Switch Wiring Error	The proximity switch sensing the mast actuator at almost nested position appears to have its complimentary outputs wired backwards	This check is only made at power-up when the mast thinks it is nested. The black and brown wires on the proximity switch may need to be swapped. The proximity switch not being energized could also cause it. Place a magnet close to the switch to check before changing wiring. Refer to system schematics in section 4.4

4.5.1.2 RCP Board

The remote control positioner (RCP) board is located in the positioner at the top of the mast and is assigned unit number two (2). It should be noted that having the RCP covers off can cause improper RCP operation, especially outdoors. The RCP board may generate the messages of Table 4-2:

Table 4-2. List of Remote Control Positioner Board Faults

Message	Meaning	Root Issue	Potential Causes
Err 2,01	Pan Limit Overlap	Both pan photosensors are blocked simultaneously	Foreign material in one of the photosensors or faulty photosensor. Check to make sure there is no foreign material in the photosensors. Clean with a soft cloth. If this does not get rid of the fault, replace RCP board
Err 2,02	Tilt Stuck	The state of the tilt photosensor has not changed even though the motor has been told to move for some period of time	Something is preventing movement of tilt mechanism or the motor is defective. Check to see if voltage is being applied to the tilt motor. If it is, replace the gearmotor. Otherwise, the problem is in the photosensor on the RCP board. Replace RCP board
Err 2,04	Pan Stuck	The state of the pan photosensors have not changed even though the motor has been told to move for some period of time	Something is preventing movement of pan mechanism or the motor is defective. Check to see if voltage is being applied to the pan motor. If it is, replace the gearmotor. Otherwise, the problem is in the photosensor on the RCP board. Replace RCP board

Err 2,07	Unrecoverable Communication Error	The RCP board has not sent out communications recently	Bad connection in communications link, or RCP is not powered or is inadequately powered. Make sure the power at the RCP board is at least 10.5 volts. Check continuity of the internal coiled cable between the base board and the RCP board (see system schematics in section 4.4)
Err 2,08	Software Fault	Internally detected error	Indicates a software problem. Notify Will-Burt
Err 2,09	Tilt Up Limit	The tilt down photosensor was made before the up photosensor indicating wrap around or the up photosensor is linear or defective	Check to make sure the tilt flag is not located in between the two photosensors. If it is, slowly move the left light bank by hand (with power off) until it is in the proper position. Readjustment of the flag may be necessary to set the proper home position. If the flag is not in between, replace the RCP board
Err 2,10	Tilt Down Limit	The tilt up photosensor was made before the down photosensor indicating wrap around or the down photosensor is linear or defective	Check to make sure the tilt flag is not located in between the two photosensors. If it is, slowly move the left light bank by hand (with power off) until it is in the proper position. Readjustment of the flag may be necessary to set the proper home position. If the flag is not in between, replace the RCP board

Err 2,13	Pan Right Limit	The left pan photosensor was made before the right photosensor indicating wrap around or the right photosensor is linear or defective	Check to make sure the pan flag is not located in between the two photosensors. If it is, slowly move the RCP head by hand (with power off) until it is in the proper position. Readjustment of the flag may be necessary to set the proper home position. If the flag is not in between, replace the RCP board
Err 2,14	Pan Left Limit	The right pan photosensor was made before the left photosensor indicating wrap around or the left photosensor is linear or defective	Check to make sure the pan flag is not located in between the two photosensors. If it is, slowly move the RCP head by hand (with power off) until it is in the proper position. Readjustment of the flag may be necessary to set the proper home position. If the flag is not in between, replace the RCP board
Err 2,15	Tilt Limit Overlap	Both tilt photosensors appear to be blocked simultaneously	Foreign material in one of the photosensors or faulty photosensor. Check to make sure there is no foreign material in the photosensors. Clean with a soft cloth. If this does not get rid of the fault, replace RCP board

4.5.1.3 Remote Control(s) Board

The handheld remote control board is located in the handheld unit and is assigned unit number three (3). The Remote Control board may generate the messages of Table 4-3:

Table 4-3. List of Remote Control Board Faults

Message	Meaning	Root Issue	Potential Causes
Err 3,07	Unrecoverable Communication Error	The Remote Control board has not received communications from the base board recently	Bad or improper connection in communications link, or Remote Control is not properly powered. Check continuity of the data lines from the DC power cable connector to the Remote Control connector. Refer to system schematics in section 4.4. Check to make sure that the base board software is 2.6 or newer. Refer to section 0 on how to check software revision level. Also check that the shield in the junction box has a good electrical connection all the way to the frame rail.
Err 3,08	Software Fault	Internally detected error	Indicates a software problem. Notify Will-Burt

Warning Codes

Warning codes are presented on the LED eight-digit alphanumeric display. The codes are a combination of numbers that identify both the general location of the warning, and the type of warning. The first of two numbers is a single digit number indicating which board. The second number is a two-digit number indicating the warning. Warning codes differ from Fault codes in that they do not require clearing. If the condition causing the warning goes away, so does the warning. At that point, normal operation continues. The codes are as follows:

Table 4-4. List of Warning Codes

Message	Meaning	Root Issue	Potential Causes
WRN 1,04	Lookup Light	The output driving the Lookup light does not seem to have a light hooked to it. (The measured current is too low.)	Burned out bulb. Broken wire.

4.6 TROUBLESHOOTING MECHANICAL

Table 4-5. Mechanical Troubleshooting

Symptom	Root Issue	Troubleshooting Sequence
Mast sticking during extension or retraction	Mast is dirty and/or requires lubrication.	1) Clean and lubricate mast. 2) If condition continues, mast requires overhaul.
Mast leaks down when extended	Air leak in mast or valve/compressor assembly.	Use a soapy water solution to pinpoint the leak. If the mast is leaking, it will require new seals. If the valve or compressor assembly is leaking at a fitting, remove the fitting, clean and reinstall using thread tape or sealant. Replace a faulty valve or compressor.
Erratic or noisy when raising to 90 degrees	Bent or worn actuator or pivot shaft	Replace damaged component
RCP continually pans or tilts	Bent flag in RCP	1) Remove RCP cover straighten or replace flag. 2) Make sure wiring is not wound tight. Reset home position
Pan or tilt motor will not respond with no errors displayed on Remote Control(s)	Broken or loose motor wire lead or faulty motor	1) Reconnect wire lead 2) Replace motor.
Mast fails to fully nest in saddle and disconnects power	Binding of actuator, software fault or control erroneously sensed an increase in current	1) Check that base board has software version 2.6 or later. See section 0 for verifying revision. Contact Will-Burt if update is required. 2) See Table 4-1, Table 4-2 and Table 4-3 for software fault codes. 3) Check actuator for binding. Replace actuator if binding.
Mast will not begin to lower from 90° position	Mast tube sections do not fully collapse	1) Extend and retract mast. 2) Check tube sections for damage. 3) Internal coil cord may be binding, contact Will-Burt.
Mast will not begin to lower from 90° position	Magnetic switch band clamped to mast is not made	1) Magnetic switch is may be out of adjustment. Loosen clamp and slide switch up and down the mast until contact is established. 2) Check wiring 3) Replace defective magnetic switch.

CHAPTER 5
PARTS LIST

5.1 PART LISTS

Table 5-1. Night Scan Chief Base Assembly Parts List

Mark No.	Description	Part Number
1	Base Plate	4121702
2	Base Circuit Board	4118301
3	Saddle Assembly	4122201
4	Compressor Assembly	4141101
5	Actuator	4136302
6	Mast Assembly, 6 ft	4142204
	Mast Assembly, 7.5 ft	4142202
7	Left Side Plate	4122702
8	Right Side Plate	4122802
9	Interface Panel	4122902
10	Look Up Light Assembly	913422
11	Mast Magnetic Switch Assembly	915519
12	Tube, Wireway	4123502
13	Knurled Shaft	4159201
14	Mast Stop	4121602
15	Rubber Pad	4123301
16	Proximity Sensor Mounting Bracket	4123001
17	Actuator Pivot Block	4138901
18	Actuator Shaft	4123401
19	Beeper Alarm	223002
20	Alarm Bracket	4204301
21	Strain Relief	4022403
22	Finish Plug	3781
23	Air Fitting, Swivel	4200102
24	Proximity Switch	216004
25	Stud Magnet	216005
26	Clevis	4120901
27	Key	4120801

28	Shim Washer	4122601
29	External Retaining Ring	3401
30	Spacer	4121301
31	Internal Retaining Ring	3783
32	Pivot Block	4121001
33	Sleeve Bearing	4120401
N/A	Base Cover Left	4143002
N/A	Base Cover Right	4141002
N/A		
N/A		
N/A		
N/A		
N/A		
N/A	Handheld Remote Control	4183601
N/A		

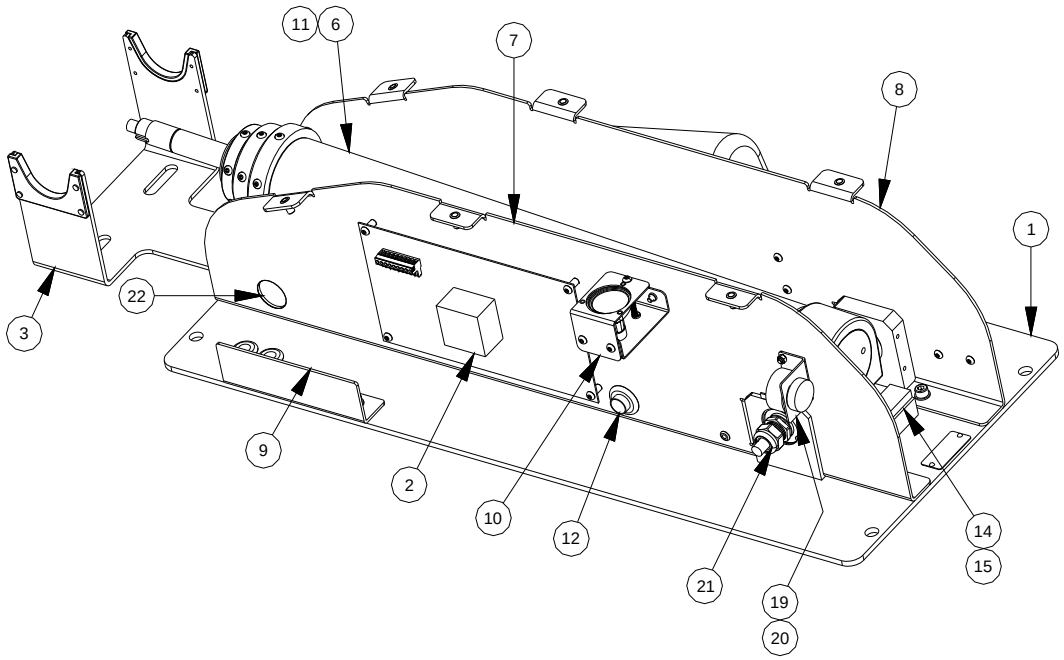

Figure 5-1 Exploded View - Base Left Side

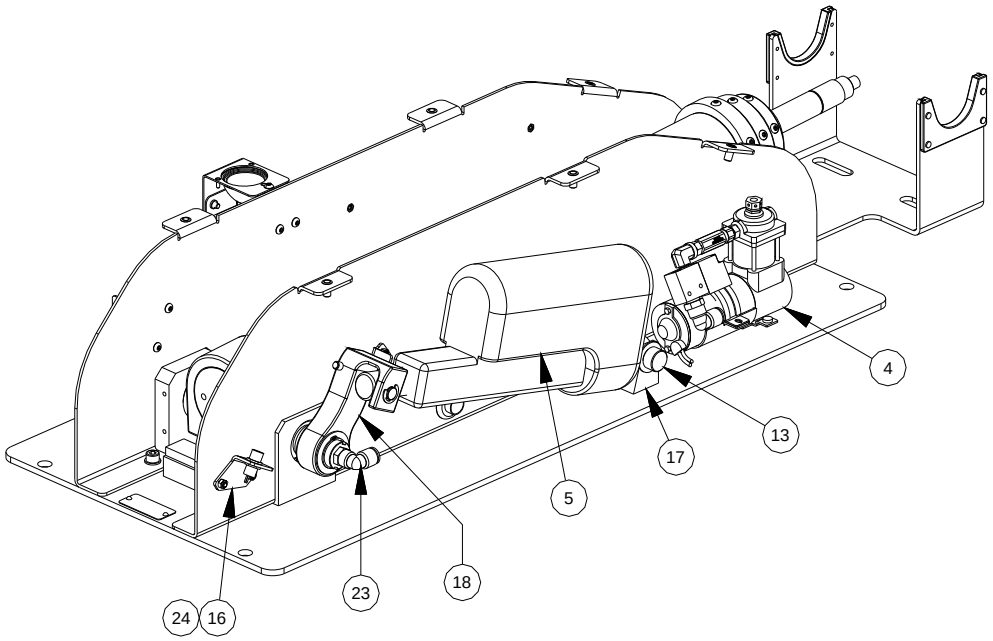

Figure 5-2 Base Right Side

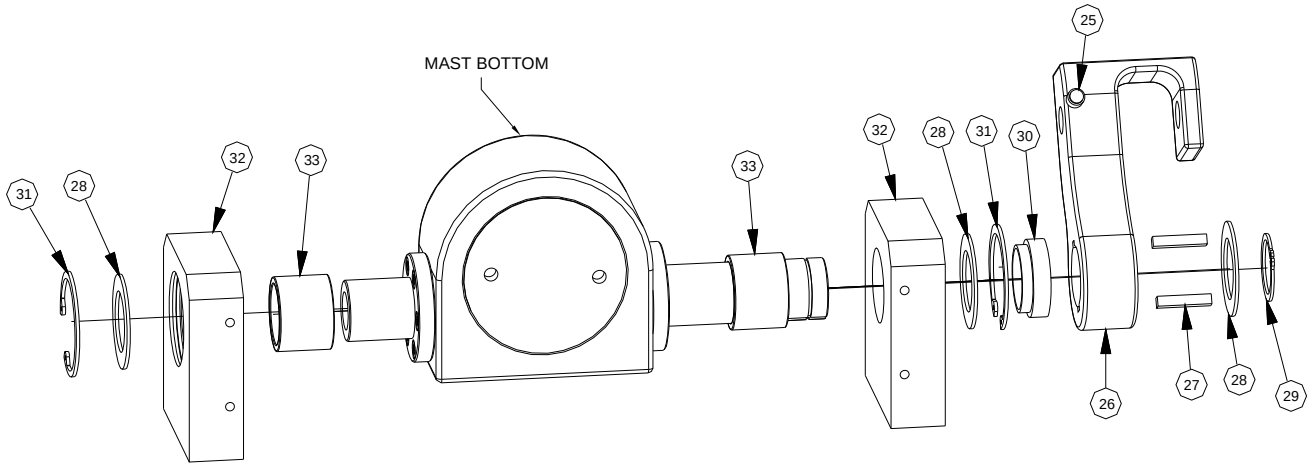

Figure 5-3 Exploded View – Mast Pivot Assembly

Table 5-2. Remote Control Positioner Assembly Parts List

Mark No.	Description	Part Number
1	Remote Control Positioner Frame	4124102
2	Circuit Board, RCP	4118401
3	Pan Bearing Housing	4124302
4	Tilt Coupling	4124801
5	Horizontal Bearing	913435
6	Bearing Retainer	4124202
7	Pan Bearing Spacer	4124401
8	Pan Gear	4124901
9	Pan Flag	4125201
10	Card Guide	913881
11	Terminal Bracket	4125401
12	Shim Washer	4203701
13	Key	4120802
14	Terminal Block	215001
15	Snap Ring	3401
16	Motor Assembly	4205001
17	Pan Bearing	3868
18	Flat Washer	3872
19	Snap Ring	4208001
20	O-Ring, PTFE	3398
21	Tilt Flag	4125101
22	Flag Mounting Ring	4125301

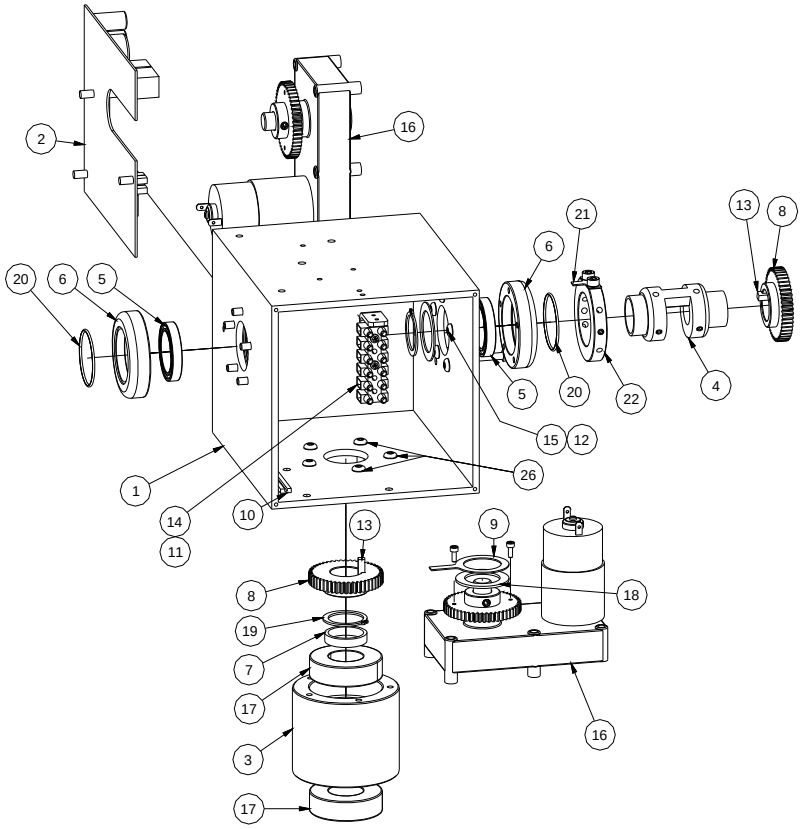

Figure 5-4 Exploded View - Remote Control Positioner (RCP)

CHAPTER 6
REVISIONS

Revision 0, October 2007: Initial Release.

Revision 1, December 2007: Update base schematic Figure 4-8 to correct inclination motor wiring and add capacitor. Add 2.10 to address capacitor use in 24 vdc multiplex installations.

CHAPTER 7
SOFTWARE REVISIONS

7.1 INTRODUCTION

There are several circuit boards in the Chief system. Each has its own microcontroller with associated software. A person may "query" the software revisions by simultaneously holding down both Remote Control tilt buttons (up, down). The revision levels can then be viewed as they scroll across the alphanumeric display. A typical display might be "1:4.3 2:4.2 3:4.2". This would indicate that board 1 (the base board) has revision 4.3, board 2 (the RCP board) has revision 4.2, and board 3 (a Remote Control board) has revision 4.2. To date, all software revisions are backward compatible, and require no hardware changes.

Table 7-1. Software Revision Log

Board	Board No.	Revision	Comments	Compatibility Issues
Base	1	4.3	Initial Release to production	None
RCP	2	4.2	Initial Release to production	None
HHRC	3	4.2	Initial Release to production	None
Base	1	4.4	Fix transceiver enable timing to prevent intermittent power up timing problem	None
HHRC	3	4.4	Fix transceiver enable timing to prevent intermittent power up timing problem	None
Base	1	4.5	Fix to SPI timing to prevent intermittent analog input read failures	None

CHAPTER 8
APPENDICES

MATERIAL SAFETY DATA SHEET

The Will-Burt Company Orrville, Ohio 330-682-7015

SECTION A: IDENTIFICATION AND EMERGENCY INFORMATION

Product Name: Mast Lubrication 900600

Chemical Name:	Cas Number:
Not Applicable (N/A)	N/A

Chemical Family:
Industrial Metalworking Compound

Emergency Telephone Number:	Revision Date:
440-543-9845 (Etna)	5/3/00

HMIS RATING: H= 1 F= 1 R= 0 PP= C

SECTION B: HAZARDOUS INGREDIENTS

This Product does not contain any SARA Section 313 reportable compounds.
This product does not contain any carcinogens as defined by OSGA, NTP and IARC at greater than 0.1%.

SECTION C: PHYSICAL & CHEMICAL CHARACTERISTICS

Boiling Point:	Specific Gravity:	Vapor Pressure:
Unknown	0.9	Unknown

% Volatile (Vol.):	Vapor Density (Air=1):	Evap. Rate (N-BA=1):
Unknown	Unknown	>1

Solubility in Water:	Ph (N/A):	Reactivity in Water:
Nil	N/A	Nil

Appearance:	Odor:
Blue Liquid	Petroleum Odor

Flash Point:	Flammable Limits (In Air % by Vol.):		Auto Ignition:
>350°F	(Upper) Unknown	(Lower) Unknown	Unknown

Extinguisher Media & Special Fire Fighting Procedures:
Use water, fog, foam dry chemical or CO2. Do not use a direct stream of water. Product may float and can be re-ignited on the surface of the water. Do not enter confined fire space without proper protective equipment including a NIOSH approved self-contained breathing apparatus. Cool exposed surfaces.

Unusual Fire and Explosion Hazards:
None

SECTION D: PHYSICAL HAZARDS

Stability:	Conditions to Avoid:
Stable	Strong Oxidants

Incompatibility:
Strong Oxidants

Decomposition Products:
Highly dependent on combustion conditions. Mixture of air-borne solid, liquid and gases evolve upon pyrolysis or combustion of this product. CO_2 and other organic compounds may be formed upon combustion.

Hazardous Polymerization:
Will not occur

Conditions to Avoid:
STRONG OXIDANTS – HEAT – SPARK AND OPEN FLAMES

SECTION E: HEALTH HAZARDS

Signs and Symptom of Exposure:

Skin:	Prolonged and repeated skin contact may cause irritation or skin disorders such as dermatitis or oil acne. Wash thoroughly with soap and water prior to using toilet facilities, eating, drinking or smoking.
Eyes:	Contact with eyes may cause temporary irritation.
Inhalation:	The inhalation of vapors (generated at high temperatures only) or oil mist may cause a mild irritation of the mucous membrane of the upper respiratory tract.
Ingestion:	Considered no more than slightly toxic if swallowed.

Medical Conditions Generally Aggravated by Exposure:
Pre-existing skin and respiratory disorders may be aggravated by exposure.

Acute Toxicity Data:

Oral LD50:	Dermal LD50:	Inhalation LD50:
N/E	N/E	N/E

Occupational Exposure Limits:

OSHA PEL/TWA	OSHA PEL/CEILING	ACGIh TLV/TWA	ACGh TLV/STEL
5mg/M3	N/E	5mg/M3	10mg/M3

Chronic Health Data:
None

SECTION F: EMERGENCY AND FIRST AID PROCEDURES

Skin contact: Remove contaminated clothing and wash with soap and water. If irritation occurs get medical attention.

Eye contact: Flush with water for 15 minutes. If irritation occurs get medical attention.

Ingestion: Do not induce vomiting. Get medical attention.

SECTION G: SPECIAL PROTECTION / SPILL AND LEAK PROCEDURES

Ventilation: Local exhaust – required only to capture vapor, mist or fumes.

Mechanical (general): As required to prevent exceeding recommended exposure limits.

Protective gloves: Use chemically resistant gloves to avoid prolonged skin contact.

Eye Protection: Use safety glasses or goggles to prevent eye contact.

Respiratory Protection: As needed to prevent overexposure to mist or fumes. Use NIOSH approved chemical mist and organic vapor respirators.

Other protective clothing or equipment: Use chemically resistant apron as needed.

SECTION H: ENVIRONMENTAL PROTECTION / SPILL AND LEAK PROCEDURES

Spill or Leak: Recover free product. Add sand, earth or other suitable absorbent to spill area. Minimize worker contact. Keep from sewers or waterways by diking or impounding. Advise authorities if product enters waterways or extensive land areas. Dispose of recovered material and residue in compliance with all federal, state, and local regulations.

Waste Disposal: Dispose of all waste products in accordance with all applicable federal, state and local regulations.

Handling and Storage Precautions: Keep container closed when not in use. Do not store near heat, open flame or strong oxidants.

SECTION I: TRANSPORTATION REQUIREMENTS

DOT Shipping Regulations:
Consider this product to be non-hazardous. No special labeling required by DOT.

SECTION J: OTHER REGULATORY CONTROLS

The ingredients of this product are on the TSCA Inventory.

The information contained herein is based on the data available to us and is believed to be correct. The Will-Burt Company does not warrant or guarantee their accuracy or reliability and The Will-Burt Company shall not be liable for any loss or damage arising out of the use thereof. The information and recommendations are offered for the user's consideration and examination and it is the user's responsibility to satisfy itself that they are suitable and complete for its particular use.

WILL-BURT PRODUCT REGISTRATION AND EVALUATION

RETURN WITHIN 90 DAYS FROM DATE OF PURCHASE
PLEASE COMPLETE THIS FORM AND RETURN TO WILL-BURT USING THE PREPAID SELF-ADDRESSED ENVELOPE WHICH HAS BEEN PROVIDED. THANK YOU FOR YOUR ASSISTANCE.

CUSTOMER NAME: _____DATE: _____
ADDRESS:
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CITY / STATE / ZIP: _____PHONE No. : _____

PRODUCT MODEL No. / NAME / DESCRIPTION:
_____

PRODUCT SERIAL No. : _____DATE OF PURCHASE: _____

DEALER NAME (WHERE PURCHASED):
_____

INSTALLER NAME:
_____

WHERE DID YOU HEAR ABOUT THIS PRODUCT?
_____

WHY DID YOU PURCHASE THIS PRODUCT?
_____

WAS THE PRICE OF THIS PRODUCT COMPETITIVE? YES _____ NO _____

WOULD YOU PURCHASE THIS PRODUCT AGAIN? YES _____ NO_____

WOULD YOU RECOMMEND THE PURCHASE OF THIS PRODUCT TO YOUR FRIENDS OR THEIR ASSOCIATES? YES _____ NO_____

DOES THE PRODUCT SATISFY YOUR NEEDS / REQUIREMENTS? IF NO, EXPLAIN:
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_____

DO YOU BELIEVE ANY FEATURE COULD BE IMPROVED TO ENHANCE THE PERFORMANCE OF THE PRODUCT? IF YES, EXPLAIN:
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PLEASE CONTINUE ON REVERSE SIDE.

ARE SATISFIED WITH THE APPEARANCE OF THE PRODUCT? YES _____NO_____
IF NO EXPLAIN :

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RATE THE INSTALLATION / OPERATION / SERVICE INSTRUCTIONS.
GOOD ____ FAIR ____ POOR_____

DO YOU HAVE ANY SUGGESTIONS FOR IMPROVING THE INSTALLATION / OPERATION / SERVICE INSTRUCTIONS? IF YES, EXPLAIN:

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ADDITIONAL COMMENTS:

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ALL SUGGESTIONS PRESENTED TO WILL-BURT COMPANY ON THIS FORM RELATED TO THE WILL-BURT COMPANY PROPRIETARY PRODUCT LINES WILL BE REVIEWED. HOWEVER, THE EVALUATION OF ANY PARTICULAR SUGGESTION NEITHER IMPLIES NOR GUARANTEES IMPLEMENTATION OF THE SUGGESTED CHANGE. ALL REVISIONS, MODIFICATIONS, AND / OR IMPROVEMENTS MADE TO THE WILL-BURT PROPRIETARY PRODUCTS AS A RESULT OF SUGGESTIONS MADE ON THIS SHALL BE THE SOLE AND EXCLUSIVE PROPERTY OF THE WILL-BURT COMPANY, AND NO COMPENSATION OR CONSIDERATION OF ANY KIND WILL BE PAID FOR SUCH RECOMMENDATIONS.

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